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EDITORIAL

IEEE ACCESS SPECIAL SECTION EDITORIAL: HEALTH INFORMATICS FOR THE DEVELOPING WORLD

We live in a world with growing disparity in the quality of life available to people in the developed and developing countries. Healthcare in the developing world is fraught with numerous problems such as the lack of health infrastructure, and human resources, which results in very limited health coverage. The field of health informatics has made great strides in recent years towards improving public health systems in the developing world by augmenting them with state-of-the-art information and communication technologies (ICT). Through real-world deployment of these technologies, there is real hope that the health industry in the developing world will progress from its current, largely dysfunctional state to one that is more effective, personalized, and cost effective. Health informatics can usher a new era of personalized health analytics, with the potential to transform healthcare in the developing world. In conjunction with mHealth and eHealth, many other important health informatics trends—such as artificial intelligence (AI), machine learning (ML), big data, crowdsourcing, cloud computing—are also emerging. Exponentially growing heterogeneous data, with the help of big data analytics, has the potential to provide descriptive, predictive, and prescriptive health insights as well as enable new applications such as telemedicine and remote diagnostics and surgery. Such systems could enhance the overall process of monitoring, diagnosis, and prognosis of diseases.

The goal of this Special Section in IEEE ACCESS on ''Health Informatics for the Developing World'' is to present a snapshot of the state-of-the-art in this important field. Our aim is to catalyze a convergence of growing research interest in health informatics from diverse fields such as ICT for development (ICTD); telemedicine; mHealth; eHealth; big data for development; biomedical engineering; human computer interaction (HCI), and to present a holistic integration of such approaches in this Special Section.

Our call for papers received an enthusiastic response with more than 20 high-quality submissions. Per IEEE ACCESS policy, it was ensured that handling editors did not have any potential conflict of interest with authors of submitted articles. All articles were reviewed by at least two independent referees. The articles were evaluated for their rigor and quality, and also for their relevance to the theme of our Special Section. We considered articles that both proposed solutions tailored particularly for the context of the developing world, and also those that were globally oriented, with solutions that could, by extension, also be applicable in the developing world. After a rigorous review process, we accepted five articles to form the Special Section.

1) In the article ''A machine learning-empowered system for long-term motion-tolerant wearable monitoring of blood pressure and heart rate with ear-ECG/PPG'', Qingxue Zhang *et al.* proposed and evaluated the design of a fully ear-worn long-term blood pressure (BP) and heart rate (HR) monitor. This is underpinned by a machine learning framework based on Support Vector Machines (SVM) to deal with the potential problems and artifacts that may arise due to head movements and human motion. An unsupervised learning algorithm is employed to automatically filter out residual distorted/faking heartbeats, for ECG-to-PPG pulse transit time (PTT) and HR estimation. The authors demonstrate better wearability through design of a system such that all electrocardiogram (ECG) and photoplethysmography (PPG) sensors are situated behind the two ears, which facilitated the acquisition of weak ear-ECG/PPG signals using a semi-customized platform. The authors presented results demonstrating the capability of the proposed machine learning-empowered system in ear-ECG/PPG acquisition and motion-tolerant BP/HR estimation, thereby illustrating the feasibility of ear-ECG/PPG-based motion-tolerant BP/HR monitoring.

2) The article ''Mobile health in the developing world: Review of literature and lessons from a case study'' authored by Siddique Latif *et al.* presented a broad-ranging review of the literature focusing on the use of mHealth in the developing world. The authors present a comprehensive report about the factors hindering the growth of mHealth in developing countries and outline strategies for making mHealth more effective. In addition to the literature review, the authors also presented a thorough case study on the public health system of Pakistan showing that mHealth can offer tremendous opportunities for a developing country that suffers from a severe scarcity of health infrastructure and resources. The authors draw out general insights from their case study and provide guidelines in terms of policies and strategies that can lead the way to a sustainable adoption of mHealth for any developing country in general.

3) In the article "A software application for survey form design and processing for scientific use", Seng Cheong Loke *et al.* proposed a technical solution for digitizing the filling up and the processing of community survey forms (such as those used in clinical studies). This work, which was supported by the Swan Foundation, Malaysia, proposed a form processing application (FPA) that covers form design, printing, scanning, and digitization. The form has a plug-in architecture and use double-keying to reduce transcription errors. The authors presented a detailed evaluation based on a field test and demonstrated that the proposed software was at least as accurate as manual data entry but was cheaper in terms of cost and reduced efforts and time consumed. The authors have also made their software open source to enable access by other researchers.

4) The article "A new hybrid intelligent framework for predicting Parkinson's disease" authored by Zhennao Cai *et al.* proposed an optimal support vector machine (SVM) based solution based on bacterial foraging optimization (BFO) to effectively predict Parkinson's Disease (PD), which is a neurodegenerative motor system disorder that degrades progressively and requires an early diagnosis for effective control before it is too late. The authors evaluated the effectiveness of their proposed method, called BFO-SVM, on a PD data set based on vocal measurements and compared their solution to two other frequently used parameter optimization methods, namely the grid-search based SVM and the particle swarm optimization based SVM. The authors presented experimental results demonstrating superior performance of the proposed framework.

5) Finally, Jon Haël Brenas *et al.* presented the findings of their research, funded by the Bill and Melinda Gates Foundation, on supporting the interoperability of malaria surveillance systems in the article " *A Malaria Analytics Framework to Support Evolution and Interoperability of Global Health Surveillance Systems*." The deadly disease of malaria is a leading cause of death in areas such as Africa and a number of agencies and organizations are undertaking projects that aim to prevent, control, and eliminate malaria. The successful management of malaria requires 1) an integrated, consistent knowledge source; 2) support for rapid data exchange between different malaria surveillance systems and platforms; and 3) overcoming inconsistencies and mismatches between components of the infrastructure. In this article, the authors presented their research towards the design and development of the Semantic Interoperability and Evolution for Malaria Analytics (SIEMA) platform, which aims to improve data and semantic interoperability for dynamic malaria surveillance and support the integration of data across multiple scales. The authors presented analysis based on sentinel sites situated in selected African countries, including Uganda and Gabon.

To conclude, we would like to sincerely thank all the authors for submitting their articles to our Special Section, and the large number of reviewers who kindly volunteered their time and expertise to help us curate a high-quality Special Section on this important and timely topic. We would also like to thank the IEEE Access Editor-in-Chief Professor Michael Pecht and other staff members of IEEE Access for their continuous support and guidance.

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